

AMENDMENTS TO THE CLAIMS

1. – 54. (Cancelled)

55. (Currently Amended) A microfluidic system comprising a substrate, wherein the substrate comprises at least one measurement chamber for containing one or more cells or lipid based cell structures, the measurement chamber comprising a substantially planar solid material, wherein the material comprises at least one raised aperture for detecting an electrical property of one or more cells or lipid based cell structures, each aperture comprising a tip, the tip comprising a housing defining a lumen, wherein at least one tip is inserted into a cell or lipid based cell structure, and wherein the substrate further comprises at least one microchannel with an outlet which opens into the at least one measurement chamber.

56. (Original) The microfluidic system according to claim 55, wherein at least one of the at least one measurement chambers is circular and a plurality of microchannels are radially disposed about the chamber and comprise outlets that open into the chamber.

57. (Original) The microfluidic system according to claim 55, wherein the aperture comprises a lumen for receiving a conducting medium.

58. (Currently Amended) The microfluidic system according to claim 57, wherein the conducting medium is ~~selected from the group consisting of a liquid conducting medium, a solid conducting medium, a semi-solid conducting medium and combinations thereof.~~

59. (Currently Amended) The microfluidic system according to claim 58, wherein the liquid conducting medium comprises ~~selected from the group consisting of an electrolyte solution, or an electrically conducting polymer, a metal and a carbon fiber.~~

60. (Currently Amended) A microfluidic system comprising a substrate, wherein the substrate comprises at least one measurement chamber for containing one or more

cells or lipid based cell structures, the measurement chamber comprising a substantially planar solid material, wherein the material comprises a plurality of solid electrode tips protruding from the material for detecting an electrical property of one or more cells or lipid based cell structures, the tips comprising a housing defining a lumen, where the housing comprises a solid state conducting material, wherein at least one tip is inserted into a cell or lipid based cell structure, and wherein the substrate further comprises at least one microchannel with an outlet which opens into the at least one measurement chamber.

61. (Currently Amended) The system according to claim 55 or 60, wherein the at least one tip is tapered to facilitate insertion into a cell or cell structure.

62. (Withdrawn) The system according to claim 55 or 60, wherein at least one tip comprises a contacting surface for contacting biological molecules or macromolecules and wherein the contacting surface comprises a hydrophilic material.

63. (Original) The system according to claim 55 or 60, wherein at least one tip comprises a contacting surface for contacting biological molecules or macromolecules and wherein the contacting surface comprises a hydrophobic material.

64. (Original) The system according to claim 62, wherein at least one contacting surface comprises a diameter of less than about 5 μm .

65. (Original) The system according to claim 62, wherein at least one contacting surface comprises a diameter of less than about 1 μm .

66. (Cancelled)

67. (Currently Amended) The system according to claim 55; ~~or 60 or 66~~, further comprising a pressure control device for controlling positive and negative pressure applied to at least one microchannel.

68. – 70. (Cancelled)

71. (Currently Amended) The system according to claim 55, or 60 ~~or 66~~, wherein the substrate is interfaced to a multiwell plate through one or more external tubings or capillaries.

72. – 75. (Cancelled)

76. (Cancelled)

77. (Withdrawn) The system according to claim 55, wherein the system further comprises a scanning mechanism for scanning a cell or cell structure relative to an aperture of the system.

78. (Withdrawn) The system according to claim 60 or 65, wherein the system further comprises a scanning mechanism for scanning a cell or cell structure relative to an electrode tip of the system.

79. (Currently Amended) The system according to claim ~~76~~ 60 or 65, further comprising a processor in communication with ~~the~~ a scanning mechanism.

80. (Cancelled)

81. (Original) The system according to claim ~~80~~ 79, wherein the processor controls one or more of: the rate of scanning, the direction of scanning, acceleration of scanning, and number of scans.

82. (Original) The system according to claim 81, wherein the processor controls one or more of the rate of scanning, the direction of scanning, acceleration of scanning and number of scans.

83. (Currently Amended) The system according to claim 55, or 60 or 66, further comprising an amplifier in communication with the at least one electrode.

84. (Cancelled)

85. (Original) The system according to claim 81, wherein in response to a signal from the a detector, the processor alters one or more of the rate of scanning, the direction of scanning, acceleration of scanning, and number of scans.

86. (Cancelled)

87. (Original) The system according to claim 81, further comprising a user device in communication with the processor, the user device comprising a graphical user display for interfacing with a user.

88. (Original) The system according to claim 60 or 66, further comprising a plurality of microchannels, and wherein the microchannels deliver a plurality of substantially separate aqueous streams into the measurement chamber.

89. (Original) The system according to claim 88, further comprising a plurality of buffer delivery and agonist delivery channels, each channel comprising an outlet for delivering a substantially separate aqueous stream into the chamber.

90. (Currently Amended) The system according to claim 88, further comprising a scanning mechanism for scanning a cell across the aqueous streams from the channels, wherein the scanning mechanism comprises translating the cells across the microchannels.

91. (Original) The system according to claim 88, wherein at least one microchannel delivers at least one agent into the measurement chamber.

92. – 102. (Cancelled)

103. (New) The method of claim 55 or 60, wherein the electrical property is a transmembrane current.

104. (New) The method of claim 55, wherein the at least one raised aperture extends from a substantially planar portion of the measurement chamber.

105. (New) The method of claim 60, wherein the plurality of solid electrode tips extends from a substantially planar portion of the measurement chamber.